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(DEPSCOR 92) Computational Modelling of Equiluminant Vision

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12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

The goal of this grant, AFOSR-93-94 was to obtain equipment for studying psychophysical and computational aspects of chromatic motion perception. The equipment consisted of color measurement, data capture, data storage and color presentation devices. Our main result include the influence of luminant motion information on equiluminant motion direction, the impact of equilumance on both page and RSVP reading, the development of computational method to eliminate motion blur, and adaptive computational model of motion perception at equilumance.

14. SUBJECT TERMS
Equiluminant motion perception.

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(DEPSCOR 92) COMPUTATIONAL MODELLING OF EQUILUMINANT VISION

Final Report for AFOSR93-94 Equipment grant

The goal of this grant, AFOSR-93-94 was to obtain equipment for studying psychophysical and computational aspects of chromatic motion perception. Most of the first year of the grant was spent purchasing and installing the equipment. The equipment consisted of color measurement, data capture, data storage and color presentation devices.

The equipment has been used in two completed Ph.D. Dissertations, one published manuscript, and several conference papers. Results from the work is summarized below:

1) Combining luminant and equiluminant motion streams - the work resulted in two studies presented at ARVO and a manuscript published in Perception [1,2,3]. The main result from this work is that the perceived direction of motion of equiluminant moving dots is not effected by the motion of luminant dots until the difference in their direction of motion is sufficiently close (i.e. <30 degrees).

2) Page and RSVP reading speed under luminant and equiluminant conditions for normal and disabled readers -- This work has resulted in a presentation at ARVO and a Ph.D. dissertation [4,5]. The main result is that for normal readers, equiluminant text dramatically slows reading speeds for page reading while having significantly less impact on RSVP reading speed rates. A secondary result is that RSVP presentation to disabled readers improved their reading speed but not as dramatically as that experienced by normal readers.

3) Eliminating motion blur through modulo switching circuits -- This work resulted in a Ph.D. dissertation [6]. Any device which senses light by integrating energy at a point, such as a video camera or our own eyes, will exhibit motion blur. Our main result is to demonstrate through computer simulation the elimination of motion blur using several layers of locally controlled switching networks.

4) Computational model of chromatic motion perception -- This work was presented at the conference on Mathematical Psychology [7]. The main result is that the perceived slowing of motion at equiluminance can be modeled by an adaptive computational structure where there are differences in the adaptive learning rates between informational channels. This suggests that the perceptual phenomena surrounding equiluminant stimuli may be the result of learning differences between neuronal pathways.

The availability of this equipment in 1994 was crucial to our being awarded an LEQSF grant (LEQSF-RCS-95-98) which supported the graduate and undergraduate students who maintained the laboratory and performed much of the work.

References

[1] S. Heidenreich and G. L. Zimmerman (1993), Evidence for directionally selective mechanism that integrates luminant and equiluminant motion , Investigative

Ophthalmology and Visual Science Supplement , 34, 1032.

[2] S. Heidenreich and G. L. Zimmerman (1994), Speed and contrast of luminant motion affect directional information of equiluminant motion , Investigative Ophthalmology and Visual Science Supplement , 35, 1270.

[3] S. Heidenreich and G. L. Zimmerman (1995) Evidence that Luminant and Equiluminant Motion Information are Integrated by Directionally Selective Mechanisms, Perception, 879-890.

[4] Beth O'Brien (1996) Luminance and Chromatic Contrast Effects on Skilled and Disabled Reading Performed with and without Required Eye Movements, dissertation advisor G. L. Zimmerman, Tulane University.

[5] Beth O'Brien and G. L. Zimmerman (1996) Reading under luminant and equiluminant conditions, Investigative Ophthalmology and Visual Science Supplement , 37,

[6] James Norton (1996) , A Vision Based Approach to Motion Deblurring, dissertation advisor G. L. Zimmerman, Tulane University.

[7] G. L Zimmerman and M. Canaday (1996), Computational model of equiluminant motion perception, 29th Conference on Mathematical Psychology, Chapel Hill, NC.

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TIME RUN 10:25:52
FBMO91

TULANE UNIVERSITY - F.Y. 93-94 FIFTH CLOSE
FINANCIAL RECORDS SYSTEM
REPORT OF TRANSACTIONS FOR 06/30/94

REPORT PAGE 32129
PROGRAM ID FBMO91
ACCOUNT PAGE 1

ACCT: S-33996
DEPT: 45400

DEPSCOR92 COMPUTATIONAL MODELLING OF EQUILUMINANT VISION

TO: GEORGE ZIMMERMAN
ENGINEERING

OBJ CODE	DESCRIPTION	DATE	EC	REF.	2ND REF.	J.E. OFFSET ACCOUNT	BUDGET ENTRIES	CURRENT REV/EXP	COMMITMENTS	BATCH REF.	BATCH DATE
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	UPS SHIPMENTS 000001	06/21	061	101864	0629009	2-21049-8063	CR	10.95		MLR001	940623
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	FIRST LIGHT	06/03	048	P114344	5065728			203.50	203.50-	APC456	940603
	FIRST LIGHT	04/07	050	P114344					314.92	ENC188	940407
	THORLABS INC	06/23	050	P350423					355.20	ENC243	940623
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3310	** TOTAL LABORATORY SUPPLIES							314.92			
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	FIRST SOURCE INTERNA	05/09	048	P347307	5060322			2,946.00	2,920.00-	APC419	940509
	SAFE HARBOR COMPUTER	02/22	050	P345302					751.00	ENC157	940222
	FIRST SOURCE INTERNA	04/06	050	P347307					2,930.00	ENC187	940406
	SAFE HARBOR COMPUTER	02/22	051	P345302					87.00-	ENC183	940330
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	B & H PHOTO AND ELEC	04/19	050	P347793					187.80	ENC196	940419
	MCCANN ELECTRONICS	06/24	050	P350500					271.90	ENC244	940624
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	COLUMBIA AUDIO VISUA	04/06	048	P345131	5053943			2,378.00	2,378.00-	APC371	940406
	TROXELL COMMUNICATIO	04/07	048	P345132	5053063			1,813.67	1,813.67-	APC373	940407
	TROXELL COMMUNICATIO	04/07	048	P345132	5053064			3,335.00	3,335.00-	APC373	940407
	COLUMBIA AUDIO VISUA	04/15	048	P345131	5055167			2,593.50	2,593.50-	APC383	940415
	PYRAMID AUDIO PRODUC	04/26	048	P345134	5060323			2,138.00	2,138.00-	APC400	940426
	MINOLTA CORPORATION	04/29	048	P346834	5057262			5,954.26	5,954.26-	APC408	940429
	TROXELL COMMUNICATIO	05/23	048	P345132	5061935			757.89	757.89-	APC432	940523
	PYRAMID AUDIO PRODUC	04/26	048	P345134	5060323			2,138.00-	2,138.00	APD437	940526
	SPECTRUM SYSTEMS	06/03	048	P345134	5069544			2,138.00	2,138.00-	APC456	940603
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	PYRAMID AUDIO PRODUC	02/16	050	P345134	B036866				2,261.00	ENC153	940216
	MINOLTA CORPORATION	03/24	050	P346834	P344489				6,500.00	ENC180	940325

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ACCT: 5-33996 5520 DEPSCOR92 COMPUTATIONAL MODELLING OF EQUILUMINANT VISION TO: GEORGE ZIMMERMAN
DEPT: 45400 ENGINEERING

OBJ CODE	DESCRIPTION	DATE	EC	REF.	2ND REF.	J.E. OFFSET ACCOUNT	BUDGET ENTRIES	CURRENT REV/EXP	COMMITMENTS	BATCH REF.	BATCH DATE
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9810	COST SHARE	10/12	020		1042304		5,300.00-			RJE318	931030
9810	** TOTAL COST SHARE-DIRECT						5,300.00-				
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ACCT: 5-33996 DEPSCOR92 COMPUTATIONAL MODELLING OF EQUILUMINANT VISION TO: GEORGE ZIMMERMAN
DEPT: 45400 ENGINEERING

OBJ CODE	DESCRIPTION	DATE	EC	REF.	2ND REF.	J.E. OFFSET ACCOUNT			BUDGET ENTRIES	CURRENT REV/EXP	COMMITMENTS	BATCH REF.	BATCH DATE
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3025	** TOTAL PH CRGS-LD-ACAC									.60			
4850	STAGE LIGHTS INC	10/07	048	P354531	6018283					232.00	232.00-	APC622	941007
	DAMARK INTERNATIONAL	12/06	048	P354517	6032845					319.99	319.99-	APC693	941206
	DAMARK INTERNATIONAL	09/13	050	P354517							319.99	ENC051	940913
	STAGE LIGHTS INC	09/13	050	P354531							232.00	ENC051	940913
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	TAPE DISTRIBUTORS OF	06/24	051	P350500							12.40-	ENC051	940913
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	COLUMBIA AUDIO VISUA	08/01	048	P345131	6000941					516.00-	516.00	APC526	940801
	MINOLTA CORPORATION	08/31	048	P344489	5048010					8,506.82		APC568	940831
	MINOLTA CORPORATION	08/31	048	P344489	6005665					8,506.82-	8,506.82	APC568	940831
	PYRAMID AUDIO PRODUC	05/26	048	P345134	6068830					61.50-	61.50	APC904	950526
	PYRAMID AUDIO PRODUC	05/29	048	P345134	5070854					123.00	123.00-	APC906	950529
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	MINOLTA CORPORATION	02/01	051	P344489							8,500.00-	ENC023	940803
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